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LECTURE

ON

THE CAMEL:

DELIVERED

BEFORE THE SMITHSONIAN INSTITUTION.

BY

HON. GEORGE P. MARSH.

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The first command addressed to man by his Creator, and substantially repeated to the second great progenitor of our race, not only charged him to subdue the earth, but gave him dominion over all terrestrial creatures, whether animate or inanimate, and thus predicted and prescribed the subjugation of the entire organic and inorganic world to human control and human use.

Man is yet far from having achieved the fulfilment of this grand mission. He has, indeed, surveyed the greater part of his vast domain; marked the outline of its solid and its fluid surface, and approximately measured their areas and determined their relative elevation; pierced its superficial strata, and detected the order of their historical succession; reduced to their primal elements its rocks, its soils, its waters, and its atmosphere, and even soared above its canopy of cloud. He has traced, through the void of space, its movements of rotation, revolution, and translation; resolved the seeming circles of its attendant satellite into strangely tortuous paths of progression; investigated its relations of density, attraction, and motion, to other visible and invisible cosmical orbs; and unfolded the laws of those mysterious allied agencies, heat, light, electricity, and magnetism, whose sphere of influence seems commensurate with that of creation. But, notwithstanding these triumphs, earth is not yet all his own; and millions of leagues of her surface still lie uninhabited, unenjoyed, and unsubdued—yielding neither food, nor clothing, nor shelter to man, or even to the humbler tribes of animal or vegetable life, which, in other ways, minister to his necessities or his convenience.

In like manner, man has studied the biography, and the relations of affinity or dependence, of the infinitely varied contemporaneous forms of organic life; traced the history of myriads of species of both plants and animals, which had ceased to be before the Creator breathed into *his* nostrils the breath of life; and demonstrated the past and present existence of numerous tribes of organic beings, too minute to be individually cognizable by any of the unaided senses, and yet largely influencing our own animal economy, and even composing no unimportant part of the crust of the solid globe; but of the vegetables that clothe and diversify its soil, of the animated creatures that float in its atmosphere, enliven its surface, or cleave its waters, but comparatively few have as yet been rendered in any way subservient to human use, fewer still domesticated and made the permanent and regular denizens of his fields or companions of his household.

The efforts of civilized man towards the fulfilment of this great command have been directed almost exclusively to the conquest of inorganic nature, by the utilization of minerals; by contriving methods for availing himself of the mechanical powers and of natural forces, simply or in cunning combinations; by cutting narrow paths for facilitating travel and transport between distant regions; and by devising means of traversing with certainty and speed the trackless and troubled ocean.

The proper savage smelts no ores, and employs those metals only which natural processes have reduced. He binds the blocks of which he rears his temples with no cement of artificial stone. He drains no swamps, cuts no roads, excavates no canals, turns no mills by power of water or of wind, and asks from inorganic nature no other gifts than those which she spontaneously offers, to supply his wants and multiply his enjoyments.

On the other hand, the very dawn of social life, in those stages of human existence which quite precede all true civilization, demands, as an indispensable condition, not the mere usufruct of the spontaneous productions of organic nature, but the complete appropriation and domestication of many species of both plants and animals. Man begins by subjugating, and thereby preserving, those organic forms which are at once best suited to satisfy his natural wants, and, like himself, least fitted for a self-sustaining, independent existence;* and he is to end by extending his conquests over the more widely dissimilar, remote, and refractory products of creative nature. We accordingly owe to our primeval, untutored ancestors, the discovery, the domestication, the acclimation of our cereal grains, our edible roots, our improved fruits, as well as the subjugation of our domestic animals; while civilized man has scarcely reclaimed a plant of spontaneous growth, or added a newly tamed animal to the flocks and herds of the pastoral ages. Indeed, so remote is the period to which these noble triumphs of intelligent humanity over brute and vegetable nature belong, that we know not their history or their epochs; and if we believe them to be in fact human conquests, and not rather special birth-day gifts from the hand of the Creator, we must admit that cultivation and domestication have so completely metamorphosed and diversified the forms and products, and modified the habits, and even, so to speak, the inborn instincts of both vegetables and animals, that but the fewest of our household beasts and our familiar plants can be certainly identified with the primitive stock. Most of these, it is probable, no longer occur in their wild state and original form; and it is questionable whether they are even capable of continued existence without the fostering care of man.

In both these great divisions of organic life there are some species peculiarly suited to the uses of man as a migratory animal. The bread stuffs of the old world, and, in a less degree, our only American cereal, Indian corn, the pulse, the cucurbitaceous plants, and the edible roots of our gardens, as well as the horse, the dog, the sheep, and the swine, seem almost exempted from subjection to climatic laws. While, therefore, a degree of latitude, a few hundred feet of elevation, a trifling difference in soil, or in the amount of atmospheric humidity, oppose impassable barriers to the diffusion of most wild plants and animals, the domesticated species I have enumerated follow man in his widest wanderings, and make his resting-place their home, whether he dwells on a continent or an island, at the level of the sea or on the margin of Alpine snows, beneath the equator or among the frosts of the polar circle.

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* It is not the domestic animals alone whose existence is perpetuated by the protective, though often unconscious, agency of man. In the depths of our northern forests the voice of the song-bird, or of the smaller quadrupeds, is but seldom heard. It is in the fields tilled by human husbandry that they find the most abundant nutriment, and the surest retreat from bird and beast of prey. The vast flights of the wild pigeon are found, not in the remote, primitive woodlands, but along the borders of the pioneer settlements; and, upon our western frontier, it is observed that the deer often multiply for a time after the coming in of the whites, because the civilized huntsman destroys or scares away the wolf, the great natural enemy of the weaker quadrupeds.

Others, again, of the domesticated families of the organic world seem, like the untamed tribes, inexorably confined within prescribed geographical bounds, and incapable of propagation or growth beyond their original limits; while others still, though comparatively independent of climate and of soil, are nevertheless so specially fitted to certain conditions of surface, and certain modes of human life, to the maintenance of which they are themselves indispensable, that even the infidel finds, in these mutual adaptations, proofs of the existence and beneficent agency of a self-conscious and intelligent creative power.

Among the animated organisms of this latter class, the camel is, doubtless, the most important and remarkable. The Ship of the Desert has navigated the pathless sand-oceans of Gobi and the Sahara, and thus not only extended the humanizing influences of commerce and civilization alike over the naked and barbarous African and the fur-clad Siberian savage, but, by discovering the hidden wells of the waste and the islands of verdure that surround them, has made permanently habitable vast regions not otherwise penetrable by man. The "howling wilderness" now harbors and nourishes numerous tribes in more or less advanced stages of culture; and the services of that quadruped, on which Rebekah journeyed to meet her spouse, and which, though neglected and despised by the polished Egyptian, constituted a principal item in the rural wealth of the father of Joseph. are as indispensable to these races, as are those of any other animal to man in any condition of society.

The camel lives and thrives in the tropics; through almost the whole breadth of the northern temperate zone; and is even met beyond Lake Baikal in conjunction with the reindeer, with which, among some of the northern tribes, he has exchanged offices, the deer serving as a beast of the saddle, while the camel is employed only for draught or burden.* But his appropriate home is the desert, and it is here alone that he acquires his true significance and value, his remarkable powers being the necessary condition and sole means by which man has in any degree extended his dominion over the Libyan and the Arabian wildernesses.

In presence of the improvements of more advanced stages of society, the camel diminishes in numbers and finally gives place to other animals better suited to the wants and the caprices of higher civilization. Upon good roads, other beasts of draught and burden are upon the whole more serviceable, or, to speak more accurately, more acceptable to the tastes of cultivated nations; and the ungainly camel shares in the contempt with which the humble ass, the mule, and even the ox, are regarded by the polished and the proud. Besides this, both the products and the restraints of proper agriculture are unfavorable to his full development and physical perfection. When the soil is enclosed and subjugated, and the coarse herbage and shrubbery of spontaneous growth are superseded by artificial vegetation, he misses the pungent and aromatic juices which flavor the sun-burnt grasses and wild arborescent plants that form his accustomed and appropriate diet; the confinement of fence, and hedge, and stall are repugnant to his roving propensities and prejudical to his health, and he is as much out of place in civilized life as the Bedouin or the Tartar. Hence the attempts to introduce him into Spain, Italy, and other European countries have either wholly failed, or met with very indifferent success; and though he still abounds in Bessarabia, the Crimea, and all the southeastern provinces of Russia. yet the rural improvements which the German colonists have introduced into those regions have tended to reduce his numbers. When the wandering Tartar becomes stationary, encloses his possessions, and converts the desert steppe into arable ground, his camels retreat before the horse, the ox, and the sheep, and retire to the wastes beyond the Don and the Volga. So essentially nomade indeed is the camel in his habits, that the Arab himself dismisses him as soon as he acquires a fixed habitation. The oases of the desert are generally without this animal, and he is not possessed by the Fellahheen of the Sinaitic peninsula, by the inhabitants of Sinah or the oasis of Jupiter Ammon, or by those who cultivate the valleys of Mount Seir.

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* Ritter, Erdkunde XIII, 662—667.

Of the primitive races of man, known to ancient sacred and profane history, but one, the Bedouin Arab, has retained unchanged his original mode of life. It is the camel alone, whose remarkable properties, by making habitable by man regions inaccessible to the improvements of civilization, has preserved to our own times that second act of the great drama of social life, the patriarchal condition. The Arab in all his changes of faith, heathen, christian, mussulman, has remained himself immutable; and the student of biblical antiquity must thank the camel for the lively illustrations of scripture history presented by the camp of the Ishmaelite sheikh, who is proud of his kindred with the patient Job, and who boasts himself the lineal descendant of Ibrahim el Khaleel, or Abraham "the friend" of God.

Naturalists divide the camel into two species, the *Camelus dromedarius*, or one-humped camel of Arabia and Africa, and the *Camelus Bactrianus*. or two-humped camel of northern Asia.* It has been suspected that the camel of the Sahara is distinct from that of more northern Africa, which is pretty certainly of the Arabian stock, and of comparatively late introduction into that continent;* but this conjecture does not appear to be supported by any direct historical or physiological evidence. The scientific specific designation of the one-humped camel is not well chosen. The term *dromas*, as applied to the camel by the ancients, was not used to indicate a *specific* difference. The *camelus dromas* was what the proper *dromedary* is now, that is, simply a *running*, or swift camel, used chiefly or altogether for the saddle; and he might be, as he may be still, of either species, Bactrian or Arabian. In fact, any light-built, easy-paced, and swift-footed camel, of whatever species or variety, is a dromedary; though there are certain breeds, in which the slender head, tall short body, small hump, clean limbs, and generally livelier color, which characterizes the stock, have become hereditary, just as similar peculiarities of form are perpetuated in the thorough-bred hunter and race-horse. In popular phraseology, the term dromedary has been to a considerable extent applied to designate a camel with two humps, from an erroneous supposition that the swift riding-camel (deloul al heiri or maherry of the Arabs, haguin or hedjin of the Egyptians) was of that species. This mistake appears to have originated in a misinterpretation of a passage of Aristotle by Solinus and Theodore Gaza; and the error, though exposed and corrected by Gesner, three hundred years ago, and by almost every naturalist who has since described the animal, continues to influence the language, and mislead the popular opinion of the nineteenth century.

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* These geographical limitations, if not strictly accurate are nevertheless sufficiently so for general purposes. Although Höst (Efterrettninger om Marokos, 270) saw the two-humped camel at Morocco, and individuals of this species are sometimes met in Syria, yet it is pretty certain that he is not bred in Africa, or in the warmer regions of the Asiatic continent, but properly belongs to northern latitudes. The one-humped camel has a wider range. He is found among the Kirghises, and in Tartary, and the highlands of central Asia; he seems to bear the cold almost as well as the Bactrian, but he has neither the speed nor the powers of endurance which characterize the dromedary of the African and Arabian deserts. Although neither species probably now exists in a wild state, yet there is good reason to believe that the Bactrian was found wild at no very remote period in the desert of Gobi, where this variety probably originated. Humboldt, Ansichten der Natur, 1, 88.

The varieties comprehended under each of the two species are numerous; but they do not differ from each other in size, in form, or in speed, more widely than the breeds of the common horse. Indeed the anatomical differences between the Arabian and the Bactrian camel are so slight, that some naturalists have maintained their specific identity; and it appears to be certain that the common physiological test of specific difference, the incapacity, namely, of the cross to propagate, does not hold good as applied to this animal.† The skeletons of the two species are distinguishable, if at all, only by a slight difference of proportion; and the visceral structure being the same in both, the only foundation for a specific distinction appears to be in the number of humps. In the living animal, the species are readily distinguished by their outward peculiarity; and besides their obvious difference, the Bactrian is shorter limbed and much more hairy than the Arabian camel.

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*Minutoli thinks he recognises the head of the camel among the figures upon an obelisk at Luxor. Upon the walls of some of the smaller apartments of the great temple of Karnac are carved heads, which certainly appear to me to resemble that of this animal more closely than of any other quadruped; and St John (Adventures in the Libyan Desert, Chap. XII) says he found the camel among the sculptures of the temple at the oasis of Jupiter Ammon. But modern Egyptologists consider some of these figures to represent the head of the lion, others that of the giraffe, and it is certain that no part of the skeleton of the camel has been met with in the catacombs. Although it appears from Strabo, that the tribes of the desert anciently employed the camel in the transport of merchandise between Captos and Berenice, as they do now between Cairo and Suez, yet there is abundant evidence to show that this animal was not used by the proper Egyptians before the time of the Ptolemies, nor does it appear to have been known upon the Barbary coast until a much later period. See Ritter's essay, Ueber die geographische Verbreitung des Kameels, Erdkunde XIII, where this question, and almost all others belonging to the geographical distribution of the camel, are discussed with the usual learning and ability of that great writer.

† Ritter, Erdkunde XIII, 659.

Some writers describe the Bactrian as upon the whole smaller and weaker than the Arabian; but as others state the contrary, the difference in this respect is probably not great. It seems well settled that in countries where the two species exist together, the cross, though inferior to the dromedary in speed, is found to be a more powerful, and for general purposes a more serviceable animal than either of the unmixed races, as possessing in a good degree the most valuable properties of both.*

The general anatomy of the camel is the same as that of other ruminants; but the hump, the horizontal posture of the head, the direction of the eye, the power of closing the nostril, the callosities upon the breast and legs, the spreading and cushioned foot, and above all the curious structure of the stomach, to which he owes his most valuable property, the power of long abstinence from water, distinguish him from all other quadrupeds. The hump is simply a fleshy, or rather fatty, protuberance upon the back, like that of the bison, unsupported by any special bony process, and it is least developed in the highest bred animals, so that the maherry of the Sahara is popularly described as being without that appendage. The fullness of the protuberance, however, depends much upon the condition of the animal. The state of the hump is a test constantly referred to in the sale or hire of the camel, and the jockeys resort to various contrivances to give it an unnatural plumpness and solidity.† When the camel has been, for a length of time, full fed, and subjected to moderate labor only, the hump assumes a greater plumpness of form and hardness of texture; but if ill kept or overworked, the fat of the hump is absorbed, and the protuberance becomes flaccid, and is sometimes even reduced to little more than its skin. It seems to serve as a repository of nutriment, and the absorption of its substance into the general system appears to be one of the special arrangements by which the camel is so admirably fitted for the e of privation to which he is destined.‡

The head of the camel, especially of those of the Bisharye and Ababdeh breeds, is carried high and nearly horizontal; and this circumstance, with the length and curvature of the neck, and the outline of the arched back, creates so strong a general resemblance between this quadruped and the ostrich, that the latter is called by the Arabs the camel-bird. The eye is projecting, sheltered above by a very salient bony arch, and its axis is nearly parallel to that of the head, though with a slight inclination towards it anteriorly. From this conformation of the organ, the sight of the animal is habitually directed rather downwards than forward, to the ground upon which he is just about to tread than to the distance. It is, in a great degree, to this structure, as I believe, that his remarkable sure-footedness is to be attributed. The eye always scans the surface where the foot is next to be placed; and in moving about among the scattered luggage and furniture of a camp, he rarely treads on the smallest article. The nostrils are fringed with long hairs, and provided with sphincters, which enable the animal to close them, and thus to exclude insects and the sand with which the desert winds are so often charged, while the hairs, to a considerable extent, perform the same office during the occasional partial opening of the apertures, required for respiration The Bedouins understand the value of a wide nostril as well as a Newmarket jockey, and they frequently slit the nose of the animal in such a way as to give each aperture the form of a Y. The slitting of the nostrils is a common preparation for a race, and I once saw this absurd operation performed upon a dozen young dromedaries, which were to contend for the prize on the following day.

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*See a valuable paper, extracted from the notes of General Harlan, in the Report of the American Patent Office for 1853, Agriculture, p. 61. According to Ritter, Erdkunde XIII, 646, and the authorities there cited, the word Booghdee, used by General Harlan to designate the cross between the Bactrian and Arabian, means the young male Bactrian. General Harlan's testimony in favor of the strength and power of endurance of the mixed breed is exceedingly strong; but he appears to undervalue the pure Bactrian, which is certainly found extremely serviceable in European and Asiatic Russia, both for draught and burden, and in those countries, at least, is almost wholly exempt from disease. Fraser, Khorasan, 273.

†Tavernier: Voyages, I. 132.

‡Carbuccia, 10.

The camel is provided with seven callosities, which receive the shock of his fall in lying down for repose, or at the command of his master for the convenience of mounting or dismounting, or of loading and unloading, and the weight of the body is supported by them when at rest. One of these is upon the breast nearly between the fore legs, two upon each of the fore, and one upon each of the hinder legs. The callosities upon the breast and at the knees are evidently organic, as they consist of a horny substance and are found in the fœtus. The others appear to be a mere thickening of the skin, and they may be the effect of friction and pressure. The full development of the callosities is one of the "points" of a good maherry, and it ought to be accompanied with a slender barrel, so that in the recumbent posture the belly shall scarcely touch the ground.

In lying down the animal throws himself slightly forward, and first bending one fore leg, poises himself for an instant, and then falls suddenly upon the callosities at the knees; he now advances the hind feet a little and drops upon the gambrel joint; the callus upon the breast is brought to the ground by a third descent, and those upon the upper and forward part of the hind leg by a fourth. Each of these movements, (which are renewed in rising,) and especially the first, is attended with a considerable shock; and the inexperienced rider is very apt to be thrown over the camel's head, unless he steadies himself by holding fast to the saddle pins. The Arabs slide down from and climb up to the saddle, without making the animal kneel, or even stopping him, and any active man may readily learn to do the same, but Europeans seldom practice this method. The French soldiers in Algeria use a long stirrup with two *steps* to mount by, and a loop upon a lance, such as were used by some ancient mounted troops, or attached to a musket, might answer the same purpose.

The foot of the camel is equally adapted to treading upon yielding sand and to climbing the rugged rock, which, in all extensive deserts, forms a much larger proportion of the surface than accumulations of sand. The surface of the wilderness is in general a hard, compact, gravelly soil, or composed of loose stones or bare rocks, and wherever it is not too hard for wear, or too soft permanently to retain impressions, the valleys pursued by the caravans are furrowed with paths which have been thousands of years in wearing. These tracks are 15 or 18 miles wide, and four or five inches deep, running generally parallel to each other at a couple of yards apart, and now and then intertersecting each other. An Arabian poem, older than the time of Mohammed, compares these paths to the stripes of a parti-colored cloak; and the Arabian traveller of the present day finds the same resemblance between the face of the desert and the "many colored coat" of its more opulent inhabitants.

The foot is composed of two long toes united by and resting upon an elastic cushion with a tough and horny sole or facing. The foot spreads upon touching the ground, somewhat like that of the moose and reindeer, and affords a broader support to the weight of the animal than almost any other quadruped is provided with. The camel, therefore, sinks less in the sand than any other large animal; but he nevertheless instinctively avoids it, as a horse does a puddle, and prefers any other surface except mud, loose rolling pebbles, and sharp pointed rocks.* The sole, though of a horny texture, is sufficiently yielding to allow the cushion of the foot to accommodate itself to the inequalities of a rocky surface,† and the camel climbs with facility ascents so steep and rugged, or even so slippery, as to be scaled with difficulty by any other domestic animal. The limestone ledges in the northern portion of the lesser Arabian peninsula are often worn to a glassy smoothness by primitive water currents, or by the attrition of the desert sands, yet the camel traverses them in all directions with entire security. Observing a caravan climb a long ascent of this description in Arabia Petrea, I had the curiosity to measure the inclination of the rock, and found the angle with the horizon to be fifteen degrees. The surface was everywhere almost as slippery as polished marble, and the length of the slope exceeded half a mile; but the whole caravan of more than fifty camels surmounted it without any accident. The northern slope of the pass of Negabad, on the eastern arm of the Red sea, appears to me even steeper than that I have just described, and the path is as rugged and the zigzags as short as those of almost any of the mule routes over the Alps, but it is constantly crossed by loaded caravans without difficulty. But these are trifles compared with the performances of camels in Algeria, as stated by the French officers. According to an official report to the war department of France in 1844, in the expedition to Milianeh, camels carrying burdens of 250 kilogrammes (550 pounds) climbed without accident slopes rising at an angle of 45 degrees, and readily traversed every route practicable by mules.‡

This structure of the foot gives the animal a peculiarly noiseless tread. The thunder which at a distance announces the approach of a troop of cavalry, does not herald the advance of a caravan; and even his rider hears but the faint rustling of the sand or the small pebbles displaced by the foot, as they roll back to the cavity left by the tracks of the animal. The regularity of his step and their gentle, purling sound, excite a peculiarly drowsy influence in the silence of the wilderness, which not even the danger of a fall enables the inexperienced traveller always to resist.

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* Denham and Clapperton's Travels, I, chap. 3, do. p. 169. Pietro della Valle complains that his camel, though the freshest and strongest in the caravan, fell in the soft sand "more than seven times in one day."

† The sole seems entirely impenetrable to thorns, and the camel treads with impunity on the strong sharp spines with which the fallen branches of the desert acacias are thickly armed.

‡ Carbuccia: Du Dromadaire, pp. 8, 169.

In mud the footing of the camel is insecure. The hind legs are little separated down to the gambrel joint, but from this point they diverge at a considerable angle, so that the ancient poem I have before quoted compares the hinder feet to two water buckets borne upon a yoke, and the increased breadth of base thus acquired contributes much to the sure-footedness of the camel on dry ground.

Upon a wet and slippery soil, on the contrary, the liability of the foot to slide is increased by this arrangement; and in case of such an accident, as the foot usually slides laterally, the hip joint is often dislocated or so badly wrenched that the animal is unable to rise with his burden and proceed upon his journey.* It is commonly said that the camel never rises after falling under his load, and that he immediately perishes under such circumstances. I have myself witnessed instanees to the contrary, although I have no doubt that where the fall is from exhaustion the death of the animal is nearly certain. Where the mud is merely a thin layer of wet earth over a rocky or other very hard surface, the camel passes over it without much risk; and I have repeatedly seen caravans travel at their ordinary pace and with entire confidence and security over pavements covered with several inches of snow and soft mud.

The camel readily fords rivers with gravelly or pebbly bottoms, and I have seen them wade around headlands in the Red sea, in water three or four feet deep; but the passage of streams with soft bottoms, or with deep water, by camels is always a matter of great difficulty. It is almost impossible to train them to enter a ferry boat, or to lie quietly in crossing rivers by this mode of conveyance; and though they float readily, yet they are bad swimmers, the roundness of the barrel and the height of the head and hump above the line of flotation exposing them constantly to the danger of losing their balance and rolling over upon the side, in which case they are sure to be lost. For this reason it is common to lash the head to the gunwale of a boat, or to support it by some other contrivance in crossing deep waters.†

But the most interesting and important anatomical peculiarity of the camel is that curious structure by which he is enabled to take in at once and retain, by a special arrangement, a sufficient quantity of water to supply the wants of the animal economy for several days. It was conjectured by Cuvier, and it is believed by some more recent naturalists, that the stomach of the camel is not only able to retain for many days water swallowed by the animal, but that it possesses the further power of secreting a special fluid for moistening the fauces and viscera, and mingling with the food in rumination, in some such way as some fish are able to keep the skin moist for some time after they are taken from the water, by the exudation of a fluid secreted for that purpose. It is even said that the fluid found in the water-sack, after the death of the camel, possesses chemical properties which prove it to be an animal secretion; but it does not appear that this fact has been established to the satisfaction of the physiological chemist.*

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* According to General Harlan, (Patent Office Report, 1853,) the hind legs are sometimes hobbled above the gambrel joint to prevent their spreading.

† Denham and Clapperton, II, pp. 80, 212. Father Huc, I, chap. 6. Lyon's Travels, p. 124.

It is not easy to explain the structure of the stomach without drawings, and it must suffice to say that, according to Sir Everard Home, it consists, like that of other ruminants, of four cavities. The first of these performs the functions of both the first and second in the horned ruminants; the second is simply a receptacle for water; the use of the third is not ascertained; and the office of the fourth is the same as that of the corresponding stomach in other animals having four gastric cavities.†

Thus by means of the nutriment supplied by the absorption of the hump, and the fluid preserved in, and, perhaps, also secreted by, the water-sack, the camel is able to travel several days without any new supplies of food or water. The period of abstinence depends upon the breed, training, and habits of the particular animal, the season and temperature, and the amount of labor demanded of him.

With respect to food, there is no doubt that the camel often endures two, three,‡ and even more days of entire privation; but long abstinence is seldom necessary, because, although there is one well attested instance of the existence of a tract of desert frequently crossed by caravans, six days' journey in width, and absolutely without a particle of vegetation,§ yet there are few portions of the Libyan or Arabian deserts where more or less of the shrubs on which the camel feeds do not occur at very much shorter intervals.

According to Denham, the African camel is prepared for long journeys by having balls of dough crammed down his throat, while, on the contrary, Father Huc, a much less reliable authority, declares that the Bactrian is hardened by several days of previous abstinence. Under ordinary circumstances, the camel is not fed at all, even on very long journeys, but is left to snatch his food as he can during the march of the caravan, or gather it more leisurely while it halts. In a journey of seven weeks which I made with these animals in Arabia Petræ in the months of May and June, but a single camel of the caravan received any food from his driver. This was a fine large animal bred by the Ababdeh Arabs, which was fed every evening with from a pint to a quart of beans.

When herbage and browse are altogether wanting, a small quantity of beans, a few handfulls of dates or even date-stones, a ball or two of dough of barley-meal, millet, or other grain, weighing from one to three pounds, or a small supply of some dry vegetable are given each camel daily. According to Edrisi, they are sometimes fed with dried fish. Denham says they are fond of bones, and Riley even declares that he sometimes saw them fed with charcoal. The favorite food of the camel consists of the leaves, branches, and seed-pods of the acacias and other prickly trees or shrubs, of thistles, and of the saline plants so common in the desert; and every vegetable zone is found to furnish some plant specially suited to his nutriment, while, in case of necessity, he scarcely refuses any green thing.* His powerful jaws and teeth enable him to grind and masticate branches of the hardest wood as thick as the finger. His palate is lined with a very hard cartilage; and the inside of the lip, the tongue, and the gums are protected by a skin almost equally impenetrable. The lips are, nevertheless, very flexible, and the upper labrum is divided. In feeding on the acacia or other prickly plants, he retracts and partially inverts the lips, grasps the twigs with the tongue and jaws, and thus crops and chews the thorniest shrubs with impunity.

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* According to Carbuccia, the fluid in the water-sack remains undamaged and drinkable several days after the death of the camel.—Du Dromadaire, 12.

† The gall bladder is wanting in the camel, and no trace of the biliary secretion has been found upon dissection.—Plinii Hist. Nat. XI, 74; Carbuccia, 103.

‡ Carbuccia, 10.

§ Denham and Clapperton, I, c. 3.

The camels domesticated in Tuscany, which, though degenerated by a residence of centuries in the moist climate and alluvial soil of the lower Arno, are of the Arabian stock, neglect the green and tender cultivated grasses, but devour with avidity the leaves and smaller branches of the oak and the alder, and the hard dry stems of the thorn, the thistle, and the broom. The working camels at the grand duke's farm, near Pisa, are sheltered and fed on hay during the winter, but the rest of the herd remain in the open air, and subsist on twigs and withered shrubs through the cold season.

The Bactrian camel has the same fondness for saline plants as his African congener; but he feeds also upon the leaves, twigs, and bark of deciduous trees, the coarsest grasses, thistles, reeds, rushes, weeds, straw, and, in short, upon such vegetable diet as is rejected by almost every other domestic quadruped.

The statements of travellers differ very considerably in regard to the quantity of solid food required by the camel. My own observation would lead me to think it extremely small. As I have already stated, he is usually not fed at all; and in travelling his only opportunity of gathering his food is between the evening halt and sunset, when he returns to the camp, with such scattering mouthfuls as he can snatch upon the march. The vegetation of the desert is usually so sparse that the quantity of nutritious food which can be collected after the day's journey is performed must be very inconsiderable; and though upon starting in the morning the animal shows signs of hunger, and much annoys his rider by suddenly stopping or starting aside to crop a tempting thorn twig or thistle, yet in an hour or two his appetite is satisfied, and he performs the rest of his task without seeming to crave food. I was assured by the keeper of the herd at Pisa, that when fed entirely on hay, the camel consumed little more than half as much as the horse; while, on the other hand, a correspondent in the Crimea informs me that the Bactrian camel requires at least fifty pounds of hay per day in winter, and another in Bessarabia estimates the daily winter supply of hay and straw at seventy pounds. Pattenger states that the camels in Beloochistan receive about fifteen pounds of meal daily, besides grass and shrubs, and he adds the singular fact that the Belooches give these animals considerable quantities of opium with their food; but most travellers state that when fed at all, the camel receives five or six pounds of meal at most. The power of the camel to abstain from water is much more frequently and severely tested than his ability to dispense with food. The testimony of travellers, as well as of native observers on this subject varies widely; but their discrepancies can generally be explained by difference of breed, of season, or the greater or less succulence of the solid food consumed by the animal.

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* Carbuccia, page 10, says that the camel never touches the "aloe;" but an official report, at page 182 of the same volume, enumerates the "cactus" among the wild vegetables consumed by him.

The most extraordinary statements I have seen are those of the official reports of the French officers attached to the dromedary corps in Algeria. One of these reports declares that the camels of the corps employed in the expedition of El Aghouat did not drink from February to May, though the weather was very hot; and General Carbuccia, the commander of the corps, positively states that the Algerine camel under no circumstances drinks oftener than once in seven days.* Although many travellers have related cases of very long privation, while the animal had daily access to an abundant supply of green succulent food, yet that excellent observer Russell mentions an instance of fifteen days abstinence as altogether unprecedented; and I have been able to find but one other well authenticated case, which is that mentioned by Denham and Clapperton,† of so long an abstinence as eight days, when the animal fed mostly on dry food. Most travellers concur in saying that under such circumstances the extreme limit of endurance of the Arabian camel, whose powers in that respect are much greater than those of the Bactrian or other northern breeds, does not exceed five or six days. The longest period of complete privation I have personally witnessed was four days in very hot weather, and upon withered fodder; and I have always observed that the camel drank as often as he had an opportunity. In most countries where the animal is used, it is said he can dispense with drinking twice as long as the horse under the same circumstances. This I doubt not is a very near general approximation to the truth.‡ These facts, however wonderful, are by no means so extraordinary or incredible as they may at first sight appear. The domestic ox, when supplied with abundance of green fodder, seldom inclines to drink. Persons familiar with sheep husbandry know that in rich pastures that animal thrives very well for many weeks in the hottest summers, without any water but that which falls in the shape of dew; and if I mistake not, Captain Stansbury's mules travelled two whole days along the margin of Salt Lake, without food or water.

It is not the mere power of abstinence alone that so eminently fits the camel for travelling the steppe and the desert. His preference for the brackish and even saline waters which almost exclusively occur in those regions, and which are often so highly impregnated with mineral substances as to be rejected by most other quadrupeds, is a property almost as valuable. Russell even states that he prefers sea-water to fresh; but this is not confirmed by other authorities, and I have seen them, when parched with thirst, rush to the sea, wade into it, and turn from it with evident disappointment on finding the water salt.

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* Carbuccia, 10, 11, 89, 204.

† Denham and Clapperton, I. c. 3.

‡ The quantity of water swallowed by the camel, after long privation, is very great. I have seen one empty at a draught three goat skins, holding not less than seven gallons each; and Riley speaks of even much greater quantities. The camel smells, or by some other sense detects water at the distance of a mile or more; and the uncontrolled violence with which he rushes to the well to satisfy his thirst is one of the greatest inconveniences, not to say dangers, of desert travel.

The rate of travel of the burden camel is exceedingly uniform, and varies little in the different species and breeds of the animal. Rennelle, Robinson, and other inquirers, have very carefully investigated this subject, with a view to the use of the camel's pace in geography as a measure of distance. His speed is naturally modified by the nature of the ground, but as all irregularities of this sort are usually compensated in long journeys, it may be safely averaged at two miles and one third per hour. Over a smooth and level surface, I have found his ordinary length of step to be six feet, and the number of steps of each foot thirty-seven to the minute. This gives a speed of two miles fifty-two hundredths to the hour, under the most favorable circumstances; but upon rougher ground it was proportionately retarded, and I believe Robinson's estimate to be a very exact average.

The length of the caravan day's journey, when there is no special motive for haste, is regulated by the distance between wells and pasture grounds; but it is seldom less than ten, and more frequently twelve or fourteen hours, and in most countries the entire day's journey is accomplished without a halt. Averaging the hours of travel at twelve, the distance performed would be twenty-eight miles, and this rate may be kept up any number of days in succession.

This is the estimate for animals with full burdens, and left to their natural gait; but in case of emergency, and especially under lighter loads and fleeter camels, both the rate of travel and the length of the day's journey may be very much increased.

Bergmann states the ordinary day's journey of the loaded Bactrian camel at forty miles, and without burden at from fifty to sixty-five miles; and my correspondents in Bessarabia and the Crimea agree in stating that upon a good dry road a pair of Bactrians will draw a load of 3,000 to 4,000 pounds a distance of fifty miles without eating, drinking, or halting. These authorities, which I believe are entirely reliable, show that for transportation the Bactrian camel is superior to the Arabian; and it appears that when properly trained he is also capable of attaining a considerable speed under the saddle, though in this respect he cannot compete with the Arabian dromedary. Some of the Arab accounts of the fleetness of the maherry are no doubt fables, and one may well question whether Johnson's story of the dromedary that bore his master on an errand of love from Morocco to Mogador and back, a distance of 200 miles, in a single day, is not exaggerated. But the numerous well authenticated evidences of this animal's great speed and power of endurance, leave no doubt that in the union of these two qualities he far surpasses the horse, as well as all other domestic quadrupeds.

Mehemet Ali, when hastening to his capital to accomplish the destruction of the Mamelukes, rode without changing his camel, from Suez to Cairo, a distance of eighty-four miles, in twelve hours. A French officer in the service of the Pasha performed the same feat in thirteen hours, and two gentlemen of my acquaintance have accomplished it in less than seventeen. Laborde travelled the distance in the same time, and afterwards rode the same dromedary from a point opposite Cairo to Alexandria, a distance of about one hundred and fifty miles, in thirty-four hours. But the most extraordinary well authenticated performance of the dromedary is that recorded by the accurate Burckhardt, under whose personal observation it fell. In this instance the animal carried its rider one hundred and fifteen miles in eleven hours, including twenty minutes spent in crossing and recrossing the Nile. Upon longer journeys the daily rate of the best dromedaries, though not equal to these instances, is still extraordinary. A French officer of high rank and character in the Egyptian service, assured me that he had ridden a favorite dromedary ninety miles in a single day, and five hundred miles in ten. Mails have been carried from Bagdad to Damascus, upon the same animals, four hundred and eighty-two miles, in seven days; and on one occasion, by means of regular relays, Mehemet Ali sent an express to Ibrahim Pasha, from Cairo to Antioch, five hundred and sixty miles, in five days and a half. But the most remarkable long journey on record is that of Col. Chesney, of the British army, who rode with three companions, and without change of camel, from Basrah to Damascus, a distance of nine hundred and sixty miles, in nineteen days and three or four hours, thus averaging fifty miles per day, the animals having no food but such as they gathered for themselves during the halts of the party.

The gaits of the dromedary are all properly paces or ambles; though in racing I have seen them break into an irregular gallop, as they also do for a short distance when hotly pursued by cavalry, and they then outstrip the horse.* The motion of the burden camel and the slow walk of the dromedary are necessarily violent, from the great length of step, and at first very wearisome to the rider; but a few days' practice accustoms him to this rough exercise, and he performs his day's journey with as little exhaustion as upon horseback. The quicker movements of the dromedary, at his average pace of five or five and a half miles an hour are much easier and less fatiguing than his walk, and a day's journey of fifty or sixty miles at this pace is an easy achievement. At much more rapid rates, however, the motion becomes again intolerably violent, and an inexperienced rider finds it almost impossible to cling to the saddle, or even to catch his breath, though at the ordinary speed the seat is more secure than on horseback.

The burden of the ordinary camel varies with the age of the animal, his breed, and training, and it ranges from three hundred and fifty or four hundred pounds for the lighter and more delicate of the Arabian camels, to twelve, and for moderate distances even fifteen hundred pounds for those bred by the Turcomans in Asia Minor. From six to eight hundred pounds would be a safe average, according to the weight of the animal and the smoothness or ruggedness of the route; and with the smallest of these loads the ordinary camel would easily surmount any mountain passes practicable to other beasts of burden. The weight of the pack-saddle, which is considerable, is excluded in these estimates. In some parts of the East the Arabian camel is employed as a beast of draught, and is even harnessed to the plough. I have seen them employed for transporting heavy stone on carts in Egypt, and they have been not unfrequently used for drawing heavy ordnance. In general, however, the Arabian camel is employed altogether as a beast of burden. In Bessarabia the Bactrian camel is used for the plough and for draught, while in the Crimea he is used for draught alone, and is seldom or never ridden in either of those provinces. Throughout Chinese and independent Tartary, however, as well as in Siberia, the Bactrian camel, though sometimes harnessed to wheel carriages, is much more generally employed for the saddle or burden; and the prejudice which has extensively prevailed that the configuration and sensitiveness of the humps forbids the use of the pack-saddle for this species, appears to be without foundation.

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* Carbuccia, 16, 77. Bergmann *apud* Ritter, XIII, 691.

In whatever mode the camel is employed, his harness is very simple. In some regions he is guided by a plain halter, in others the septum or one of the alæ of the nose is pierced, an iron ring inserted, and to this is attached a cord to serve as a bridle; and in the military service it has been found convenient to use the halter and this rude bridle in conjunction.* In the burden caravans the camels are not unfrequently tied head to tail, in files of about seven animals, the driver riding ahead upon a donkey or a camel, and the last camel in the file carrying a bell, so that the driver may be advertised by the ear if the chain by any accident is broken.

The pack-saddle, whether for riding or for burden, is made by stuffing a bag seven or eight feet long with straw or grass, doubling it and sewing the ends together. This forms an oblong ring, which is furnished with a rope crupper and placed upon the back so as to enclose the hump. Upon this cushion rests a frame consisting of two pairs of flat sticks meeting at top like a chevron or pair of rafters, and connected at bottom by a couple of sticks two or three feet long, secured to the others by thongs. The pad soon fits itself to the shape of the back and sides, and the frame nestles into the pad, while the hump rising in the centre of the whole apparatus keeps everything in place, so that no girdle, or at most a loose rope, is needed to confine the saddle. The load stowed in sacks, or better still in rope nettings, is balanced across the saddle, and the water-skins are suspended beneath.

The gear of the dromedary is somewhat lighter, but of the same fashion. The wooden frame is more neatly made, the uprights being curved outwards and uniting at top in two conical pummels, one before and one behind, six or eight inches high, and perhaps two in diameter at the base, covered with figured brass plate or otherwise decorated, and terminating in a knob. Over the saddle is thrown a large pair of saddle-bags of striped goat's-hair cloth, ornamented with fringes and cowrie shells, and upon this are laid blankets, cushions and carpets, and perhaps a gay housing over all. The rider is perched at the summit of this pyramid, directly over or perhaps a little in advance of the hump; and his stirrups, if he uses them, his water-bottle, his gun, a smaller pair of saddle-bags or a carpet-bag, or any other convenience he may choose, are hung to the pommels. In riding the maherry, however, the wilder tribes sit on a small saddle placed upon the shoulders, in front of the hump, and sustain themselves in their seat by crossing the ankles over the neck.*

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* Carbuccia, 44, 45, 50, 51, 133. According to Erman and Father Huc, the Northern Tartars pierce the septum of the nose and insert a piece of wood or bone, to which they attach the reins of the bridle.

As the camel lies down to receive and discharge his burden, he is very quickly and conveniently loaded and unloaded; the latter operation generally consisting simply in loosing a knot of the cord by which the packages are slung across the saddle, and the camel then immediately rises and goes in search of pasture. On returning to the camp at veening he lies down between the packages; and if these consist of merchandize or other articles not requiring to be opened at night, the driver has only to knot the cord again, and the animal is ready for the march. The pack-saddle is very rarely removed; and as the camel very seldom stretches himself on his side or attempts to roll, the saddle is never lost.

For draught he is simply yoked to the pole of the wagon, just as the ox is with us, and requires no other gearing. This extreme simplicity and economy of harness has, with trifling modifications, been carried into the military service by the French in Algeria, and wherever else the camel has been employed in war, and is found to answer all purposes as completely as the costly furniture with which we supply our cavalry. Every soldier may be his own saddler, and he requires no material but bagging, straw or grass, a little cordage, and a few small sticks, which may be found wherever there is any arborescent vegetation, to extemporize at an hour's warning the complete equipage of his beast.

The training of the camel commences when he is quite young, and, as his *manège* is very simple, it is soon completed. At the close of his third or early in his fourth year he is in his full strength, and the period of his service begins earlier and lasts longer than that of the horse. In Algeria he never attains a greater age than thirty years, and he is fit for labor for about fifteen or twenty years. In Syria and Asia Minor his ordinary life and service is ten years longer; while in the Crimea, as I am assured by a Russian officer of great experience in the use of the animal, the Bactrian sometimes lives to a hundred, and, upon an average, to sixty or seventy; though another correspondent in Bessarabia states the ordinary term of his life at thirty-five years.

The average height of the Arabian camels I have measured was nineteen hands, or six feet four inches, to the top of the hump, the head being an inch or two higher. The tallest I have used measured seven feet and seven feet three inches respectively. The very powerful Turcoman camel is somewhat lower than the Arabian, and the height of the Bactrian is stated at from six to eight feet, his weight at one third more than that of the ox, which in the Crimea is estimated at nine hundred pounds, making the weight of the camel twelve hundred; and I was informed at Pisa that the camels of the grand duke's stables sometimes weighed fourteen hundred pounds.

The swift dromedary varies much in size. Layard mentions a deloul (the name of this variety in the Syrian desert) from the Nedjd, where very fine animals are raised, which was little taller than an Arab horse;† and all the true Arabian dromedaries I have met were very small. The hedjin, a dromedary of the upper Nile, on the contrary, is much taller, frequently, I am sure, not much below eight feet; and the maherry of the great desert is taller still. Lyon speaks of a Tibboo maherry of seven feet eight inches as small; and on one occasion a dromedary of this variety, measuring not less than nine feet and a half, was brought to the camp of Captain Denham.*

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* Lyon's Travels, 114.

† Layard: New Researches, 332.

The most common colors of the camel are mouse, drab, and fawn; but black and white animals occur, and a very delicate and pleasing rose tint is not uncommon among the high-bred dromedaries of the greater Arabian peninsula.

The milk of the camel is a very favorite drink in all countries where the animal is used, and it is highly salubrious and nutritious. Some tribes possessing large herds live wholly upon it during a great part of the year, and it is very frequently given to favorite horses, which are extremely fond of it.† My own curiosity never led me to taste it, but the ladies of my party drank it constantly for many weeks, and found it both agreeable and refreshing; though, when the pasturage was particularly dry and spicy, they thought it rather too highly flavored with the aromatic savors with which, as poets sing, even the air is charged in Araby the blest. The quantity given in the desert without green food is small, certainly not exceeding a quart; but the Bactrian camel, which enjoys in general a more succulent diet, yields twice as much.

The utility of the camel does not cease with his life. His flesh, especially the hump and heart, is a favorite food among all camel-drivers, and when the animal is in good case it is described as little inferior to beef; but in the desert the camel is seldom killed until it is almost ready to die of exhaustion, and European travellers have found it in that condition tough and ill-tasted. The skin varies in thickness and strength with the breed, and is found of all qualities from that of the horse to the toughness and solidity of sole leather. Athough I have seen camels regularly sheared, yet, in general, the hair is wrenched off by hand at the time of shedding the coat. In southern latitudes the quantity is small, and the fibre short and coarse; but the Bactrian yields a fleece weighing ten pounds, of longer and finer fibre; and there are varieties in the basin of the Caspian with long silky hair scarcely inferior in quality and value to the wool of the Cashmere and Thibet goat. These breeds would be well worth introducing for the fleece alone.‡ The tallow is hard and firm, and for candles scarcely inferior to spermaceti or wax,§ and the bones would, no doubt, be found of value in the arts.

The Arab holds the camel and the date-palm to have been formed out of the same clay as our common father Adam, and to have proceeded more immediately from the hand of the Creator than any other quadruped or tree; and he believes he shall meet them again in Paradise. Mohammed proclaimed his dispensation from the back of a camel, and was translated to Paradise by the same conveyance.

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* Lyon: Travels in Africa, 313. † Denham and Clapperton, I, 169.

‡ Father Huc. (American edition,) I. chap. 9, Ritter XIII, 676, 654. Erman, Reisen, I. 198, speaks of the camel's hair shawls brought to the fair of Nishnei Novgorod from Bokhara as of the most extraordinary fineness and beauty. They are made of the hair or rather wool combed from the belly of the animal, and spun into yarn as fine as human hair, and are sold at higher prices than the most delicate Cashmeres.

§ Carbuccia, 82—Ritter XIII, 692.

The camel alone is permitted to carry the sacred veil to Mecca, and he serves as the pulpit from which the Cadi preaches at Mount Ararat the annual sermon to the pilgrims to that holy spot. Notwithstanding these high claims, the Arab seldom pets his dromedary as he does his horse.

Beyond an occasional handful of food, and a dressing of the snows of the extreme north, he is never housed or otherwise sheltered in any of the wide range of elimates through which he roves. To the extremest heat of an African sun the Arabian camel is utterly indifferent; and the Bactrian braves, without shrinking, the chilling frosts and the icy blasts of northern Siberia. I have often watched the camel's habits in this respect in the desert, and though we sometimes encamped near palms and other trees, or where he would readily have found a shelter beneath the cool shadow of a rock, I could never discover that, even under the most glaring light and scorching heat, he at all preferred the shade to the sun.

The camel, though less vicious than the horse, is not altogether so patient an animal as he is generally represented. His anger is indeed not easily excited, but when once thoroughly irritated, he long remembers the injury which has provoked him, and the "camel's temper" is a proverbial expression used by the Arabs to denote a vindictive and unforgiving disposition.* Although he sometimes strikes with the fore foot, yet the hoof being unarmed, his blows are feeble, and his only dangerous weapon is his teeth. These are used with powerful effect in the barbarous fights which are sometimes got up as spectacles, but it is only under certain special circumstances, which are easily avoided, that he attacks his driver.

His only ordinary manifestation of discontent is the harsh and ill-natured growl he sets up whenever he is approached to be loaded or mounted, and especially when any attempt is made to overcharge him. In the stillness of the desert the growl of a caravan, preparing for the morning's march, is heard for miles around; though the true maherry seldom growls, and it is said there are breeds which have entirely lost this disagreeable peculiarity; yet, in general, silent as is the march of a burden caravan, its halts are very unmistakeably announced to all wanderers within a long distance of its track. So harsh indeed is the growl of the camel, that Father Huc gravely declares that his camel-driver, on one occasion, put a pack of wolves to flight by tweaking his camel's nose till he roared again.†

The Arabs habitually travel much by night, and this not, as has been supposed, for the sake of the guidance of the stars, which they seldom need, but partly to avoid the greater heat of the day, and more especially to allow the camel, which never feeds by night, the day-light for gathering his food.* It is common to start from midnight to two o'clock, and to march, without halting, ten, fifteen, or sometimes twenty hours, after which the camp is formed; and if it is not yet dark, the camels are turned out to graze till sunset, when they return to the camp, are hobbled, by tying up one of the folded fore legs, and ruminate and sleep to the hour of departure. Although so long a day's journey without pause is fatiguing to the rider. yet, except with light dromedaries, experience is in favor of the practice. To halt without unloading the camels would afford them no relief, but fatigue them the more by practically lengthening their day's work; and if they are unloaded and allowed to wander in search of food, the time lost in collecting them and rearranging their burdens would bring the caravan too late to the camping ground. Where, however, the party, as is the case with military expeditions of a few days' length, is unaccompanied by burden camels, and the dromedaries are loaded with only the equipage, water, and provisions of their riders, the hours of travel and repose can, without inconvenience, be arranged and varied to suit the exigencies of the occasion.

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* Höst, an accurate observer, says, (Efterretninger om Marokos, 269,) that the Sultan of Morocco had camels trained to act as executioners, and all writers concur in representing the male as dangerous during the rutting season. According to Carbuccia, pp. 7, 8, 83, this paroxysm is calmed by tarring the head of the camel, or permanently prevented by a simple process attended with little inconvenience, and no danger to the animal.

† Father Huc, I, chap. 3.

The question of the practicability and advantages of introducing the camel into the United States for military and other purposes, is one of much interest and importance; and I hope I shall be pardoned if I prolong a discourse, which I fear has proved but a dry one, for the sake of suggesting some considerations upon a topic to which I have devoted some attention, both at home and abroad.

Among those who are practically familiar with the habits and properties of the camel, and who have studied the physical conditions of our territory west of the Mississippi, there is, I believe, little or no difference of opinion on the subject; and I am persuaded that the ultimate success of judicious and persevering effort is certain, and will be attended with most important advantages. At the same time, it must not be concealed that, as much depends on a point that nothing but experience can determine,—the selection, namely, of the particular breeds best adapted to our climate, soil, and other local conditions,—the result of a first experiment, unless tried on a liberal scale, and with animals of more than a single variety, is extremely uncertain. The question must be considered under two aspects: the one regarding the camel as simply a beast of burden; the other, his value as an animal of war. But even if it is conceded, which I by no means admit, that the organization of a proper mounted dromedary corps is impracticable or inexpedient, it does not, by any means, follow that the camel may not be of great value in the commissariat, and in all that belongs to the mere movement of bodies of men, as well as in the independent transportation of military stores and all the munitions of war.

The first question to be discussed is the adaptation of any variety of either species to the climate and soil of any portion of our territory. So far as mere extremes of temperature are concerned, it is quite certain that we have nowhere, west of the Mississippi, fiercer or more long-continued heats, more parched deserts, or wastes more destitute of vegetation, than those of the regions where the Arabian camel is found in his highest perfection; and the Bactrian thrives in climates as severe as even the coldest portion of our northeastern territory.

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* Fraser, Khorasán, 379.

There is, however, it must be admitted, one point of difference between our general climate and that of the eastern continent which has an unfavorable bearing on the question. I refer to the greater moisture of our atmosphere and the greater frequency of rains during the summer season. In general, the countries where the camel thrives have a proper dry season, little or no rain falling during the summer months. But to this rule there are exceptions. The valley of the lower Danube has summer rains, and a very wet autumn, winter, and spring; and many northern Asiatic districts are subject to similar climatic conditions. But the objection, whatever may be its force, seems to apply merely to the proportion of the year during which the animal can labor, and not to its influence upon his constitution; because, it appears that in the cold and damp Russian provinces the camel is less subject to disease, and attains a greater longevity, than in any other part of the world; and it is remarkable that in the Crimea, at least as I am informed, he is little used in the hottest and driest season, because the heat is found too great for that variety, and his services are most valuable in winter.

On alluvial and other soft soils caravans using the camel will, no doubt, be obliged to halt during rains and until the ground is dry; but upon all other surfaces, one or other of the species may be used without regard to weather or season; and as none of the passes of the Rocky mountains are more rugged or steeper than those of Arabia or Tartary, there is every probability that he may be advantageously employed over all the known routes between the Mississippi and the Pacific coast.

In reference to the special properties of the different varieties it may be observed that, although, as we have already seen, the Arabian camel traverses the roughest routes and climbs exceedingly steep ascents, yet the Bactrian and the cross between the two species are even better fitted for scaling difficult mountain passes. This difference is, probably, partly due to habit and training; but the greater elongation of the toe of these breeds, which sometimes projects beyond the cushioned sole and forms a sort of claw, undoubtedly somewhat facilitates climbing by giving a grasp to the foot-hold, for which reason the Bactrian anciently was, and sometimes still is, called the mountain camel.

My Russian correspondents, to whom I have so often referred, say that the Bactrian is chiefly used for winter transportation, and that his feet require no protection, but, to use their own words, are so formed that he travels well not only on frozen ground, but upon ice and snow. Timkowski saw caravans of this breed cross a glacier; and Bergmann says that, in winter, the Calmucks prefer them to horses for the saddle, because their long legs enable them to wade through deeper snows, and adds that they bear severe cold better than the horse, the ox, or the sheep.

Father Huc and Pallas give similar accounts of the power of the Bactrian camel; and Pallas adds that he is used not only in deep snows and half-frozen morasses, but that he fords rapid torrents, and, with a little training, even swims well.

In the month of February, Erman saw, at Kiachta, on the Russo-Chinese frontier, herds of camels in the open air, feeding on withered and frozen wild vegetables, at a temperature of 25 degrees below zero of Fahrenheit, and remarks that they fear neither the severe winter of Siberia nor the parching summer heats of the sand-wastes of the desert of Gobi. The alternation of thaw and frost alone, says he, is dangerous to them, in consequence of the icy crust formed under such circumstances, which wounds their feet and limbs.

So numerous is the camel in these frozen realms, that almost the whole commerce between Russia and China, by way of Kiachta, is carried on by means of them; and they transport merchandise over the whole of the vast distance between Orenburg on the Ural, and Petropawlowsk on the peninsula of Kamtschatka. In the month of October, Timkowski met on the desert of Gobi, in latitude 46°, and at the height of 2,500 feet above the sea, a herd of 20,000 camels; the Russian expedition against Khiva and Bokhara, in 1840, employed more than an equal number; and Berghaus estimates the number of camels in European Russia at not less than 100,000.

So far, then, as climate and soil are concerned, it may be regarded as quite certain that the Bactrian camel can sustain any exposure to which he would be subjected in our trans-Mississippian territory; and there is no reason to doubt that the mezquit, acacia, and other shrubs, and the saline plants known to exist in many of those regions, would furnish him an appropriate and acceptable nutriment.

I cannot speak with equal confidence of the ability of the Arabian camel, and especially of the maherry of the desert, to bear corresponding trials. All high-bred animals are delicate, and impatient of exposure to great extremes and sudden changes; and although Denham and Clapperton speak of hard frosts in latitude 13° north, and Lyon records a temperature four degrees below the freezing point, in districts constantly traversed by the maherry, yet the finest and fleetest animals will not bear the winter climate of Algiers.* But, although we may not be able to breed dromedaries of a speed equal to the most extraordinary performances I have described, there is no reason to doubt that the more common animal, which will travel eight or ten hours a day at five miles an hour, for many days in succession, and with greater speed for a shorter period, can be bred and used with advantage throughout our southwestern territories, and on all the more southern passes of the mountains which divide the valley of the Mississippi from the Pacific slope, as well as throughout the State of California.

The ancient Asiatics, and, at a later period, the Romans, made a very extensive use of the dromedary in war, not only for the transportation of men and munitions, but as technical cavalry in actual combat; and they are still employed in Persia, Bokhara, and Tartary, for military purposes, and especially for the conveyance of light pieces of artillery, which are mounted between the humps, and used in that position, the camel kneeling while the gun is loaded, aimed, and fired. In modern European armies they have hardly been employed, except by Napoleon, in transporting the baggage of his army in the Syrian campaign, in his celebrated dromedary regiment; and, more recently, by the army of occupation in Algeria. Upon the march from Egypt to Syria, the baggage, the camp equipage, and the sick,* of an army of 15,000 men, were transported solely by camels.

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* Carbuccia, 4.

It is remarkable that the military archives of France furnish little or no information, beyond the mere number of the corps, respecting the dromedary regiment of the army of Egypt, the historical documents belonging to the subject having been chiefly lost or suppressed; and all we know concerning it is derived from an imperfect and erroneous account in the great work on Egypt, and a late paper by Gourard, one of the savans who accompanied the expedition. Without entering into minute detail, it must suffice to say that this regiment, which numbered something less than 500 men, was organized in the main like a regiment of cavalry, and performed the same general service, with the most brilliant success. Although the men were taken from the infantry, a very short time was required to teach them the new discipline and drill, and the animals were habituated to the necessary evolutions in an incredibly short space of time. The services rendered by the corps were of a most important character, and its performances, according to Prétat, were quite unprecedented in military annals. This officer states that the ordinary march of the regiment was thirty French leagues, or about seventy-five miles, *without a halt;* and that a detachment belonging to it marched six hundred miles in eight days. These latter extraordinary statements rest on the testimony of a single individual, and though the corps was composed wholly of picked animals and picked men, and animated by the energy of a Bonaparte, it is very difficult to yield them full credence.

The experiments in Algeria, though satisfactory to the officers charged with them, whose reports seem entirely conclusive upon the value and economy of the camel as an animal of war, have been attended with less brilliant results. The prejudices of the officers and men against the use of this awkward and ungraceful animal in the regular service have proved very difficult to overcome. The peculiar organization of the French commissariat has interposed serious pecuniary obstacles, and the government has always seemed disinclined to consider this question in a spirit of liberality and candor. It is, however, proved that the use of the dromedary contributes in a most important degree to the economy, the celerity, and the efficiency of military movements in desert regions; and I cannot doubt that it would prove a most powerful auxiliary in all measures tending to keep in check the hostile Indians on the frontier, as well as in maintaining the military and postal communication between our Pacific territory and the east.

There are few more imposing spectacles than a body of armed men advancing under the quick pace of the trained dromedary; and this sight, with the ability of the animal to climb ascents impracticable to horses, and thus to transport mountain howitzers, light artillery, stores, and other military matériel into the heart of the mountains, would strike with a salutary terror the Comanches, Lipans, and other savage tribes upon our borders.

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* For the transportation of the *wounded* the camel is not so suitable, on account of the roughness of his motion; but, for even these, the *tachtirawan*, or litter borne by two camels, would probably answer. Invalids often travel, as I have witnessed, in a *cajava*, or, as it is sometimes called, a *mahafa*. This consists of a pair of boxes or frames, properly with a canvass sacking, five feet long, two wide, and two deep, slung across the pack-saddle, and protected by an awning. A strong camel will carry two persons in this way.

The habits of these Indians much resemble those of the nomade Arabs, and the introduction of the camel among them would modify their modes of life as much as the use of the horse has done. For a time, indeed, the possession of this animal would only increase their powers of mischief; but it might in the long run prove the means of raising them to that state of semi-civilized life of which alone their native wastes seem susceptible. The products of the camel, with wool, skin, and flesh, would prove of inestimable value to these tribes, which otherwise are likely soon to perish with the buffalo and other large game animals; and the profit of transportation across our inland desert might have the same effect in reclaiming these barbarians which it has had upon the Arabs of the Siniatic peninsula.

Among the advantages of the camel for military purposes, may be mentioned the economy of his original cost, as compared with the horse or mule, when once introduced and fairly domesticated;* the simplicity and cheapness of his saddle and other furniture, which every soldier can manufacture for himself; the exemption from the trouble and expense of providing for his sustenance, driving, sheltering, or shoeing him; his great docility, his general freedom from disease,† his longevity, the magnitude of his burden, and the great celerity of his movements, his extraordinary fearlessness,‡ the safety of his rider, whether from falls§ or the viciousness of the animal, the economical value of his flesh, and the applicability to many military purposes of his hair and his skin, the resources which in extreme cases the milk might furnish, and finally his great powers of abstinence from both food and drink.‖

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* The price of the camel is exceedingly low in all countries where he is bred. Except for the highest breed, maherries, it nowhere, except in the Crimea, exceeds fifty dollars, and is in general considerably below this sum. The reason of this is that it costs nothing to breed the animal. The dam continues to labor during the whole period of gestation, (which runs according to climate, from eleven, or in some cases, ten to twelve months,) and even the dropping of a foal scarcely delays her march. (Denham and Clapperton, I. c. 3, Ritter XIII, 610.) The young requires no care and little training, and is already serviceable in his third year.

† According to the concurrent testimony of all observers, no domestic animal is so free from disease as the camel. General Harlan's statement, that he is more liable to maladies than the horse, is unsupported by any other writer, and it must rest on some local peculiarity of climate or of breed. My correspondents in southern Russia describe the Bactrian as almost completely exempt from all ailments. In Algeria the camel suffers much from the sting, or more properly the oviposition of an insect; and it might be important, in importing the animal from that country, to select a season when he is free from the egg and the larvæ, in order to avoid introducing the insect with the camel.

‡ Carbuccia, 25, 168.

§ The security of the seat, though at once *felt* by all who have mounted the camel, seems hardly reconcilable with the violence of his motion, and is not easily explained ; but nothing is more rare than a fall from his back. Every oriental traveller can testify that the Arabs often sleep upon their camels when on the march, and Colonel Chesney (Expedition to the Euphrates, II, 671) and Layard give curious accounts of the preparation and even cooking of food on the backs of the camels by the Arab women, during forced marches. They even contrive to milk the milch animals without halting.

‖ The use of the camel has enabled the corps which have employed it in Algeria to dispense altogether with a baggage train, as the animal can transport a very considerable burden, in addition to the soldier and his accoutrements, at a much more rapid rate than the ordinary march of a column of infantry or artillery.

I may add another advantage, which will be appreciated by all who know the difficulty of conducting a caravan of mules or horses across the plains. I mean the security from stampedes and other nocturnal alarms and losses. The dromedary is a much less timid animal than the horse or mule, and he is not sufficiently gregarious in his habits to be readily influenced by a panic terror. The mode by which he is confined at night furnishes a complete security against escapes from fright or other causes. As he lies down, he folds the forelegs under the body. The Arab passes a loop around one or both of the folded limbs, above the knee, and secures the end of the cord around the neck. When both legs are thus shackled, the camel can rise only to the knee: if one only is hobbled, he rises with difficulty, and moves very slowly; and if an Indian were to cut the loop, and thus free the animal, and even succeed in mounting him, he would not be able, without a previous practice, which he has not the means of acquiring, to put him up to such a speed as to elude pursuit.* There is another point which I have never heard insisted on, but which has often struck me with some force in riding the camel. I mean the greater range of vision which, in a level country, the greater elevation of the seat gives the rider. The eye of a horseman is upon an average scarcely eight feet above the ground. Upon the dromedary it is two feet higher, and commands a wider range accordingly.

To all these advantages I am aware of no drawbacks but the expense of introducing the animal and experimenting with him, and the difficulty of accustoming horses to the sight of him. The first objection is too trifling to be debated in a case of so much importance; and though the latter has been found formidable in Tuscany, and according to Father Huc, even in Tartary, where the camel has been very long in use, yet it is of no great force as applied to the sparsely populated regions of the Far West, and as the multiplication of the animal would be gradual and slow, it is not likely that any great or general evil would flow from this source.

The facts I have recited seem to me abundantly to warrant the conclusion that at the least the experiment is worth trying, and it is highly desirable that it should be tested on a scale large enough and varied enough to embrace all the chances of success.†

For transportation, the choice would lie between the Turcoman camel of northeastern Asia Minor and the Bactrian. The former might easily be procured at Aleppo, and shipped at Alexandretta, or perhaps better at Trebizond, on the Black sea. The Bactrian, which seems on the whole the more promising animal, might most readily be obtained at Odessa, or in the Crimea; but, as the camels of those provinces are trained only for draught, it would be more advisable to procure them from the Calmucs, in the neighborhood of the Caspian, where they are used for burden and for the saddle, and, according to Bergmann, possess great speed, and they could be shipped at some of the ports of the sea of Azow, or they might perhaps, with even greater convenience, be bought at Petropawlowsk, on the Pacific, at the season of the visit of the caravans, and landed in California.

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* The only serious inconvenience attending the use of the camel in marching through a country inhabited by hostile Indians, is the necessity of allowing him to wander in search of food; but as he habitually returns to camp before sunset, of his own accord, and never feeds, and very seldom stirs during the night, he would require to be watched only for a couple of hours during the whole twenty-four.

† Very full information on the military qualities and the hygiene of the Arabian camel, upon the dromedary regiment of the army of Egypt, and the use of this animal in war by the ancients, may be found in the work of Carbuccia I have so often cited, and the papers of Gourard appended to it. The title is: Du Dromadaire comme bête de somme, et comme animal de guerre; par le Général G. L. Carbuccia. Paris, 1853. The appropriation made by Congress for introducing the camel ($30,000) will prove hardly sufficient, it is to be feared, for trying the experiment on a sufficiently liberal scale; and it is therefore doubly important that advantage should be taken of the knowledge acquired by the French in their African possessions.

The dromedaries should be brought from Algeria rather than from Egypt, because they are there accustomed to much severer winters, a moister climate, and a rougher country; and the experience of the French military service in the use of them might be of great value in aiding in the selection of the breeds or individual animals, as well as in furnishing patterns of the best harness and gearing. The number of each ought to be at least sufficient for the organization of a small regular corps, to be trained in the use of them, and the officers should be provided with all the information which can be gathered from Asiatic and European experience on the subject.

"If," says General Marey Monge, "cavalry had been unknown in France, and we, seeing the great advantages derived from it by the Arabs, had now for the first time attempted to introduce it into our military service, we should have had a thousand difficulties to overcome. Objections would have been made on the score of kicks and bites, errors would have been committed in the choice of saddles and bridles, the horses would have met with accidents or contracted ailments from our want of experience and ignorance of farriery; in the first engagements, our mounted men would have been thrown or run away with, they would have been clumsy in managing their arms on horseback, and probably been roughly handled by the superior skill of the Arab horsemen. A party would have been formed against the innovators, who would themselves have become disgusted, and the attempt to introduce mounted corps would perhaps have been abandoned; but if, in spite of accidents, mistakes, and losses, we had persevered, we should have ended by forming what we have now, an efficient and excellent cavalry."

This argument is as valid with us as it was in Algeria; and if the experiment shall be tried in the United States without success, it will probably fail for reasons as specious but as inconclusive as those which General Monge supposes against the introduction of cavalry into the French military service.

Note.—A late writer in the Révue Orientale, 1280, says: "I knew in Egypt a camel driver who had bought a dromedary belonging to a sherif of Mecca, deceased, at Cairo. This animal often made the trip between the latter city and Suez, going and returning in twenty-four hours, thus travelling a distance of sixty leagues in a single day." [The performance of the dromedary is rather understated. The actual distance between Cairo and Suez is *eighty-four* English miles, and the animal must consequently have accomplished one hundred and sixty-eight miles in twenty-four hours. He remained four hours at Suez for rest, and therefore travelled at the rate of eight miles and four tenths per hour.]